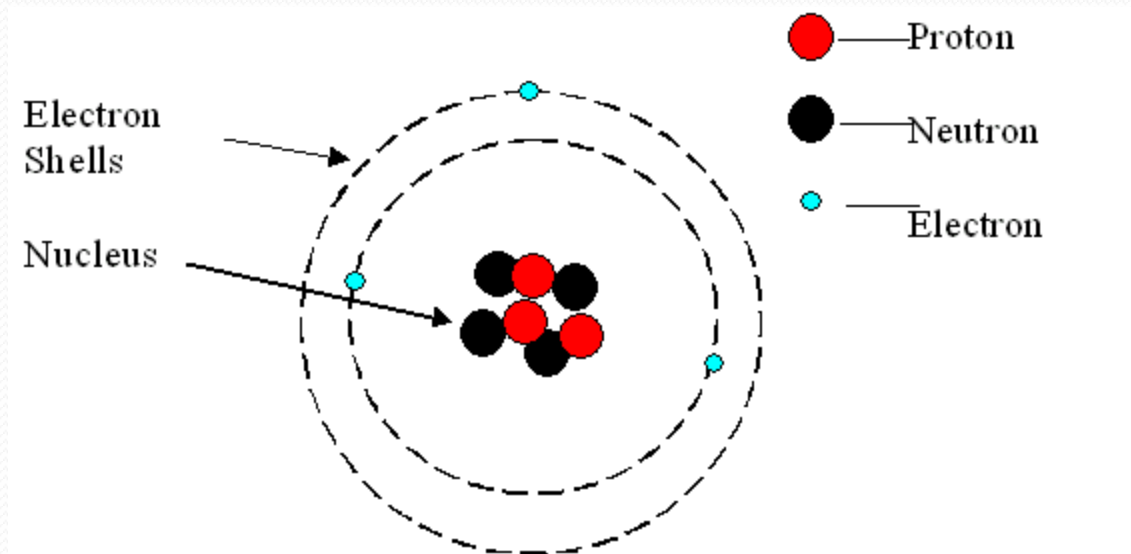


# Atomic Structure

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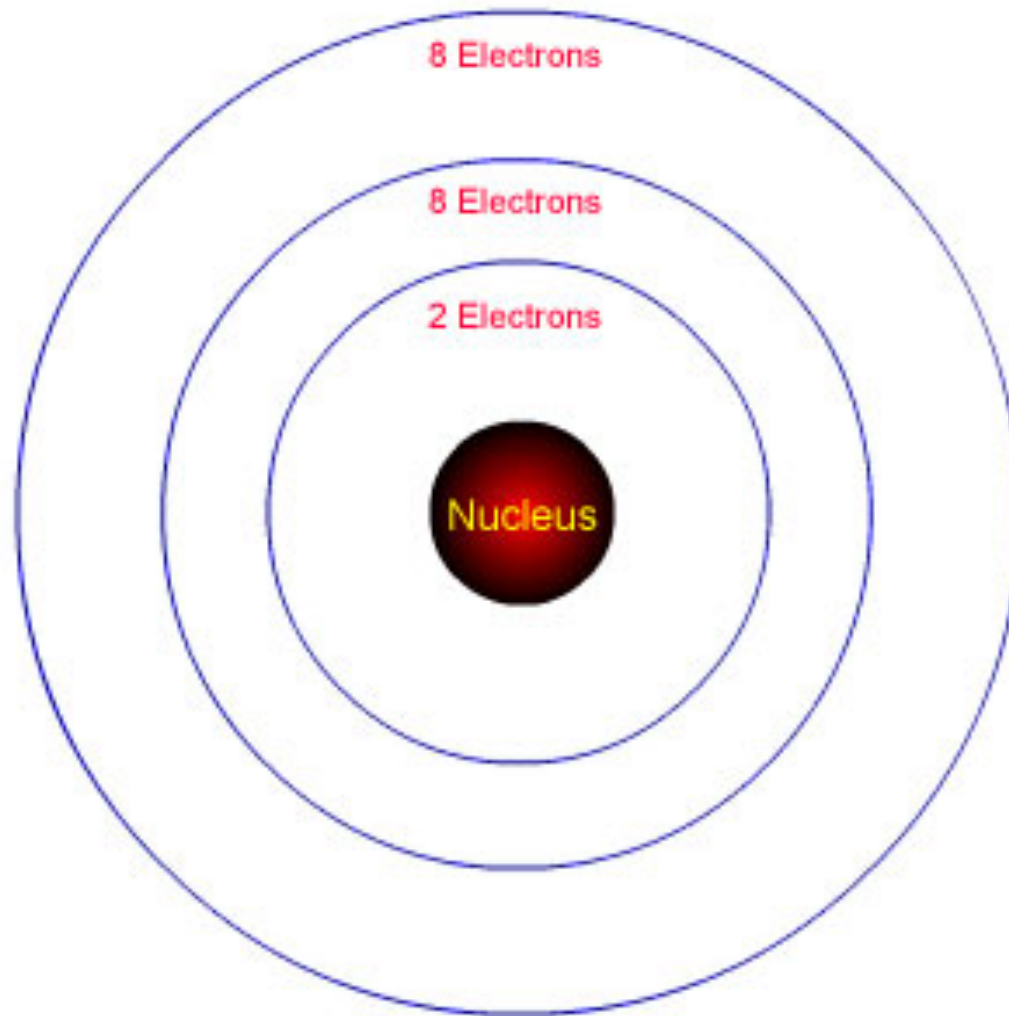
## Chapter 3

# A. Inside the Atom




Particle	Where in the atom	Relative mass (amu)	Charge
Proton	Nucleus	1	+1
Neutron	Nucleus	1	NONE
Electron	Orbiting the nucleus	About 0 (1/2000)	-1

## B. Electron Shell



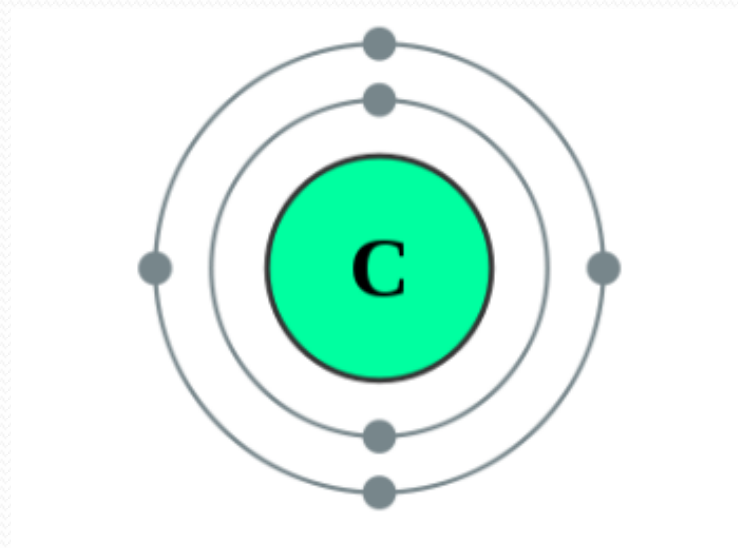
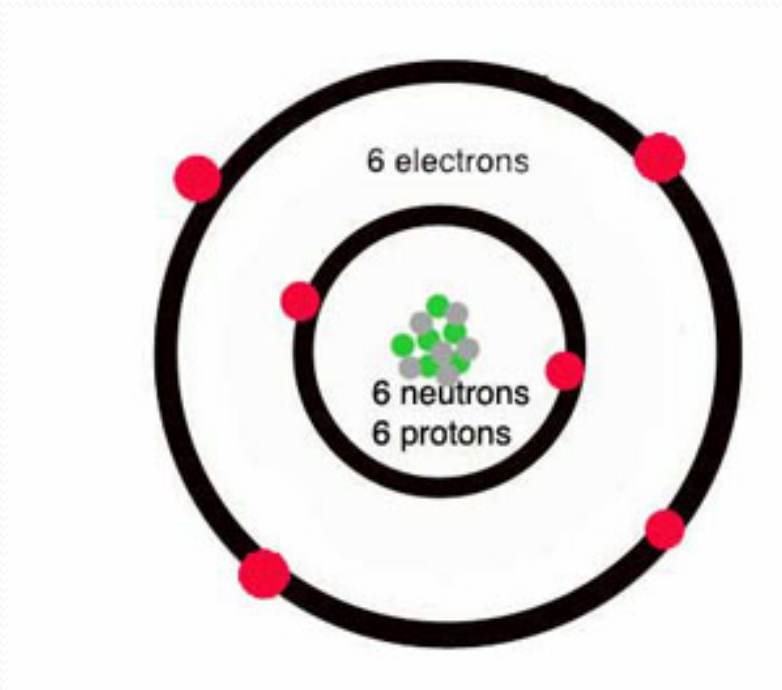
Shell diagram of a neutral atom. The positively charged nucleus is surrounded by clouds of negatively charged electrons, arranged in successive shells. The first (inner) shell holds a maximum of 2 electrons; the second and third shells can hold 8 outer electrons each.



**Question 1: Carbon has 6 electrons and 6 neutrons. Draw a diagram of the carbon atom and write the electronic structure.**



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**Electronic structure: 2, 4**



**Question 2: Sodium has 11 electrons. Draw a diagram of the sodium atom and write the electronic structure.**

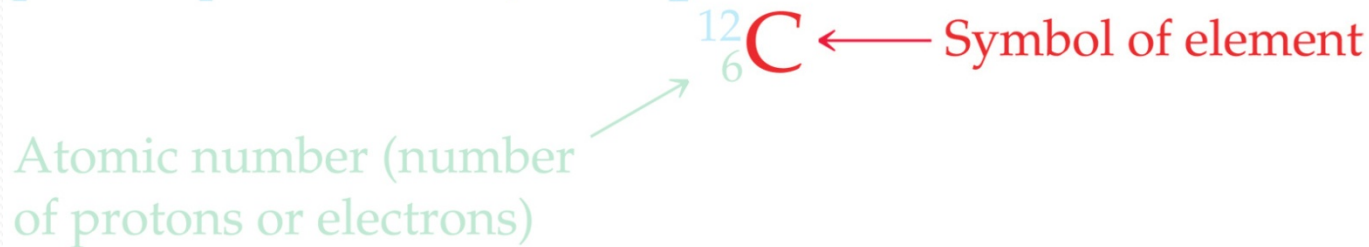
**Question 2: Sodium has 11 electrons. Draw a diagram of the sodium atom and write the electronic structure.**



**Electronic structure: 2, 8, 1**

## C. Symbols of Elements

Mass number (number of  
protons plus neutrons)



Atomic number (number  
of protons or electrons)

**Elements are symbolized by one or two letters.**



# C. Symbols of Elements

Mass number (number of protons plus neutrons)

Atomic number (number of protons or electrons)

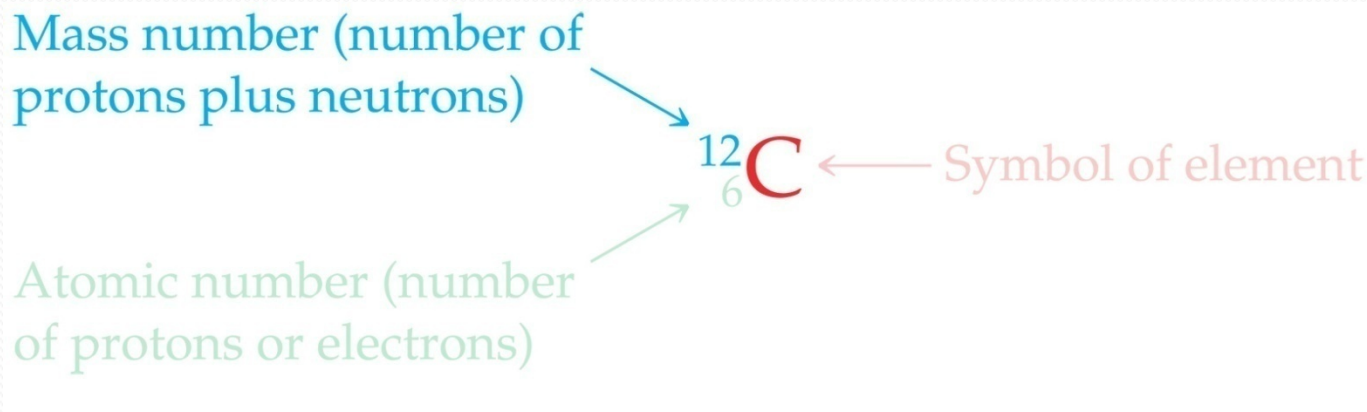
$^{12}_6\text{C}$

Symbol of element

All atoms of the same element have the same number of protons:

The atomic number (Z)

## C. Symbols of Elements



The mass of an atom in atomic mass units (amu) is the total number of protons and neutrons in the atom.

## D. Mass Number

A boron atom can have 5 protons and 5 neutrons  
so ...

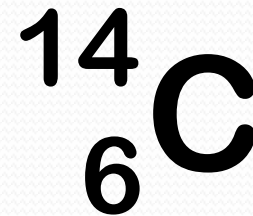
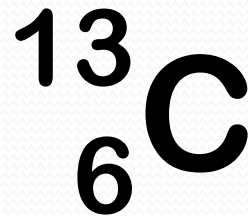
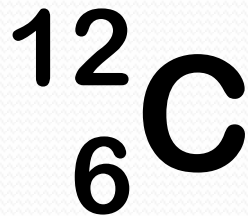
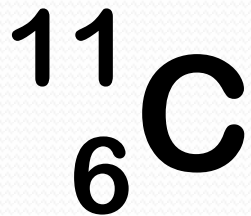
$$\text{Mass number} = 5 \text{ p} + 5 \text{ n} = 10 \text{ amu}$$

Question: Find the number of protons, neutrons,  
and electrons for

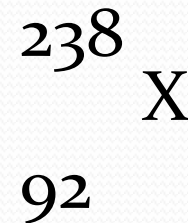
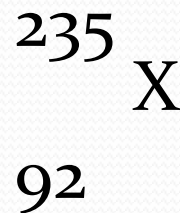
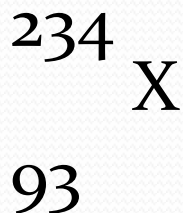
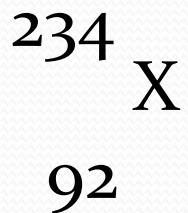


# E. Isotopes

- Atoms of the same element with different masses.
- Isotopes have different numbers of neutrons.



**QUESTION:** Which of the following represent isotopes of the same element? Which element?



Naturally occurring carbon consists of three isotopes,  $^{12}\text{C}$ ,  $^{13}\text{C}$ , and  $^{14}\text{C}$ . State the number of protons, neutrons, and electrons in each of these carbon atoms.

$^{12}\text{C}$   
6

$^{13}\text{C}$   
6

$^{14}\text{C}$   
6

#p<sup>+</sup> \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

#n<sup>0</sup> \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

#e<sup>-</sup> \_\_\_\_\_


\_\_\_\_\_

\_\_\_\_\_

## F. Relative Atomic Mass

- NOT THE SAME AS MASS NUMBER!
- WHY? Because it takes into account the different isotopes each element has.
- Look at the periodic table, do you see the mass of any element as just a whole number?





**QUESTION:** Calculate the relative atomic mass of Chlorine if you know that 75% exists as Chlorine-35 and 25% exists as Chlorine-37.

**QUESTION:** Calculate the relative atomic mass of Chlorine if you know that 75% exists as Chlorine-35 and 25% exists as Chlorine-37.

$$(.75 \times 35) + (.25 \times 37) = 35.5 \text{ g/mol}$$

# G. Relative Formula Mass

- Also known as “Molecular Mass”
- It is the relative mass of a molecule
- Example:  $\text{C}_2\text{H}_6$

$$(2 \times 12) + (6 \times 1) = 30 \text{ g}$$

- QUESTION: What is the relative formula mass of glucose,  $\text{C}_6\text{H}_{12}\text{O}_6$